

A New Species of *Culex* (*Eumelanomyia*)
from India with Descriptions of Pupae and
Larvae of *Cx. pluvialis* Barraud and *Cx. iphis* Barraud
(Diptera: Culicidae)¹

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ABSTRACT. All known stages of *Culex* (*Eumelanomyia*) *mohani* new species from the Nilgiri Hills, Madras, India and the hitherto unknown pupae and larvae of *Cx. pluvialis* Barraud from Sri Lanka and *Cx. iphis* Barraud from India are described and illustrated.

INTRODUCTION

Since publication of a revisionary study by Sirivanakarn (1972), additional material of a number of species of *Culex* (*Eumelanomyia*) Theobald have accumulated from various parts of Southeast Asia and neighboring areas. In this material are specimens collected by B. N. Mohan in the Nilgiri Hills, Madras, India in 1974 and by E. L. Peyton and Y.-M. Huang in Sri Lanka in 1975. These collections contain reared adults with associated immature stages of a new species, *Culex pluvialis* Barraud 1924 and *Cx. iphis* Barraud 1924. Immatures of the latter 2 species are described for the first time. The description of the new species (*Cx. mohani*) is dedicated to B. N. Mohan whose collections of topotypic specimens of *Culex* in the Nilgiri Hills have been a valuable contribution to the taxonomic knowledge of several Indian species.

The format and terminology used follows Sirivanakarn and Ramalingam (1976).

Culex (*Eumelanomyia*) *mohani* new species
(Figs. 1,2)

FEMALE. Wing 2.9 mm. Forefemur 1.4 mm. Proboscis 1.6 mm. Abdomen 1.8 mm. Small, blackish species without any distinctive coloration; in general as described for the subgenus (Sirivanakarn 1972) with the following diagnostic features. Head. Decumbent scales of vertex entirely pale yellowish, scales in center narrow, linear, slightly broader on upper eye margin; erect scales numerous and predominantly pale bronzy or golden; lateral patch of broad appressed scales whitish. Palpus and proboscis dark scaled; palpus about 0.2 of proboscis length. Thorax. Mesonotal integument dark brown or nearly black; mesonotal scales narrow, moderately dense and dark except for a few pale ones on anterior promontory, prescutellar space and midscutellar lobe; acrostichals and dorsocentrals well developed. *Apn* and *ppn* paler or same color as mesonotum, scales absent. Pleuron with a broad darkened area covering *ppl*, *ssp*, *psp*, *stp*, and lower *mep*, rest of pleural area pale; scales absent; 1 lower *mep* bristle. Legs. Anterior dorsal surface of fore- and midfemora dark scaled; anterior surface of hindfemur with whitish longitudinal stripe from base to apex, rest of legs entirely dark. Wing. All scales dark and moderately dense; scales on veins R_2 ,

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R₃, and R₄₊₅ narrow, clavate. *Abdomen*. Terga entirely dark scaled; sterna yellowish white.

MALE. In general as described for the female, with following diagnostic features. *Head*. Palpus dark, slender and short, similar to female. Proboscis dark; false joint present at about 0.75 of the length from base. Antennal flagellar whorls strongly plumose; minor whorls of short setae well developed.

MALE GENITALIA (Fig. 1). *Segment IX*. Tergum narrow, with a row of 3,4 short, weak setae on each side of median bare area; lateral sclerite broad, strongly pigmented; sternum narrow, without setae or scales. *Basimere*. Broad, oval shaped, length about 0.25 mm; its apex with a strong, distally forked seta on sternal surface; inner tergal surface with a row of 9,10 strong setae extending from near base to beyond level of subapical lobe and 3-5 irregular rows of short, weak setae mesad. *Subapical Lobe*. Strongly modified; proximal and distal divisions widely separated; proximal division represented by a short, narrow, elongate stalk which bears 2 rodlike setae on its apex and 1 smoothly curved rod basad; followed distally by a group of 2 large, subapically fringed blade-like setae and 2 short, hairlike setae; distal division represented by a large, prominent stalk, bearing on its apex 1 thick, dark, acuminate leaf. *Distimere*. Large, with modified truncate apex, more or less resembling a human foot; basal 0.5 with 5-7 minute setae proximad of median curvature; outer and inner surfaces wrinkled, with or without spicules distad of median curvature; 1 tiny dorsal and ventral seta present; claw present, placed near tip of recurved point. *Phallosome*. Aedeagus simple, oval-shaped; lateral plate broad, bearing about 20 strong denticles on upper tergal surface; its apex tapered into a blunt point. *Proctiger*. Apical crown composed of 4,5 flat and blunt spicules laterally and several dark, spinelike spicules mesally; basal sternal process absent; cercal setae 3,4.

PUPA (Fig. 1). Abdomen 2.3 mm. Paddle 0.72 mm. Trumpet 1.6 mm; index 15. Cephalothorax and abdomen yellowish with indefinite brownish areas not forming distinct pattern. *Trumpet*. Slender, long, cylindrical; dark brown; apical margin truncate; meatus with a short slit (= "pinna slit" of Sirivanakarn 1972). All setae developed, the following are diagnostic. *Cephalothorax*. Seta 1-C usually double (2-3); 3-C single; 5-C double or triple; 8-C 3,4 branched. *Metanotum*. Setae 10, 11-C subequal, double. *Abdomen*. Setae 1-III, IV 6-8 branched; 1-V 4,5 branched; 1-VI 3,4 branched; 1-VII double; 3-I-III double, subequal; 5-IV 3,4 branched, 5-V, VI double, as long as segment following; 6-III-IV triple; 6-V, VI double; 9-VII, VIII short, subequal; 9-VII double; 9-VIII 4 branched, its base placed almost at caudolateral angle; 4-VII double; 5-VII single; 4-VIII double. *Paddle*. Broad, pale; midrib weak, lightly pigmented; setae 1,2-P present, minute.

LARVA (Fig. 2). Head 0.72 mm. Siphon 1.5 mm; index 9. Saddle 0.36 mm; siphon/saddle ratio about 4. In general, conforming to the *Mochthogenes* Group (Sirivanakarn 1972), with the following distinctive features. *Head*. Seta 1-C dark, spiniform, length about 0.25 of distance between bases of the pair; 4-C minute, double, about 0.25 of distance between bases of the pair; 5,6-C double; 5-C weak, short, 0.25-0.50 of the length of 6-C; 7-C 6,7 branched; 12-C long, triple, subequal to 13-C; 13-C triple. Antennal shaft pale in basal 0.50-0.75,

dark distally. *Thorax*. Spiculation absent; seta 4-P strong, single; 7-P double; 8-P single, 14-P double. *Abdomen*. Seta 6-I, II double; 7-I single; 1-III-VI 3,4 branched; 6-III-VI triple. Comb scales about 60; anterior scales short, posterior scales elongate, all rather narrow with normal fringe of spicules; seta 1-VIII 4 branched; 2-VIII single; 3-VIII 6,7 branched; 4-VIII single; 5-VIII double. Saddle seta 2-X double; seta 4-X (ventral brush) with 7.0-7.5 pairs of branched setae. *Siphon*. Slender and long; pecten teeth 11,12, distal teeth elongate with 3,4 minute widely spaced basal denticles and several fine distal denticles; subventral tufts 5 pairs, usually triple (2-3) each, 4 proximal pairs subequal, about 1.5 times as long as siphonal width at point of attachment; median caudal filament of spiracular apparatus well developed.

TYPE-DATA. *Holotype* male (97-1) with associated pupal and larval skins and slide of genitalia, Coonoor, Nilgiri Hills, *Madras*, INDIA, rock pools, 21 Aug. 1974, B. N. Mohan (collector), deposited in United States National Museum (USNM); *Allotype* female (97-2) with associated larval skin, same data and depository as holotype; *Paratypes*: 1 ♂ (151-1) with associated pupal skin and slide of genitalia; 2 ♀ (151-3,-4) with associated pupal and larval skins, Kallar, Nilgiri Hills, coconut tree stump, 23 Oct. 1974, same depository as holotype and allotype.

DISTRIBUTION. Known only from the type-locality in India. *Material examined*: 2 ♂, 3 ♀, all from individual rearing (1 pupal, 4 larval), as indicated in the TYPE-DATA; 1 lp (189-2), adult lost, Sulten Estate, ground pool, (Nilgiri Hills), 21 Nov. 1974, B. N. Mohan, collector.

TAXONOMIC DISCUSSION. *Culex mohani* n. sp. unquestionably belongs to the *Mochthogenes* Group of *Eumelanomyia* as previously interpreted (Sirivanakarn 1972). It can be readily separated from all known Oriental species in the male genitalia by the modification of the basimere, the setae of the subapical lobe and the distimere. Among the known Indian species, the adults of *mohani* strongly resemble *Culex khazani* Edwards (Sirivanakarn 1972) in general external features. It differs slightly from the latter in having the male antennal flagella more strongly plumose and in having all erect scales of the head entirely pale bronzy or golden. The larva strongly resembles *iphis* and *khazani* in most features of the chaetotaxy, but differs from them in having 5 pairs of siphonal tufts (6 in *iphis*; 7 in *khazani*). The pupa is also distinctive and can be recognized by the combination of characters noted above.

The exact affinity of *mohani* is not clear. On the basis of the above comparison, it appears to be more closely related to *khazani* than to any other known members in the subgenus. However, the unique male genitalia strongly suggest its assignment to a distinct subgroup of the *Mochthogenes* Group.

BIONOMICS. The immatures of *mohani* were found on 3 occasions, once in a rock pool, a coconut stump and a ground pool. These breeding sites were under partial or heavy shade of tropical forest at a high elevation. All adults were reared from larvae or pupa. The adult biology is unknown.

Culex (Eumelanomyia) pluvialis Barraud
(Fig. 3)

Culex pluvialis Barraud 1924:1281(♂*,♀). Lectotype ♂, Kadra, N. Kanara, Bombay, INDIA (BMNH; selection of Sirivanakarn 1972:42-3).

Culex (Mochthogenes) pluvialis Barraud: Edwards 1932:195 (taxonomy); Barraud 1934:356(♂*,♀).

Culex (Eumelanomyia) pluvialis Barraud, Sirivanakarn 1971: 68 (taxonomy); Sirivanakarn 1972:42(♂*); Sirivanakarn and Ramalingam 1976:214(♂, ♀, distribution).

PUPA (Fig. 3). Abdomen 2.05 mm. Paddle 0.60 mm. Trumpet 0.42 mm; index 8. Cephalothorax and abdomen generally brownish with pale areas forming a rather striking color pattern. *Trumpet*. Entirely dark brown, cylindrical and relatively short; meatus without slit. Chaetotaxy as figured, all setae developed, the following are diagnostic. *Cephalothorax*. Seta 8-C, 3,4 branched; 9-C double or triple. *Mentanotum*. Seta 10-C 3,4 branched; 11-C double; 12-C 4 branched. *Abdomen*. Setae 1-III-VII weak and short; 1-III 5,6 branched; 1-IV 4,5 branched; 1-V-VII double or triple; 5-IV-VI subequal, nearly as long as segment following; 5-IV 3,4 branched; 5-V,VI double; 6-III-VI weak, short, subequal, double; 2-VII mesad of 1-VII; 9-VII double or triple; 9-VIII 5 branched, placed almost at caudolateral angle. *Paddle*. Entirely pale whitish, contrasting sharply with preceding abdominal segment; midrib very weak and pale; setae 1,2-P present, minute.

LARVA (Fig. 3). Head 0.65 mm. Siphon 1.07 mm; index 8. Saddle 0.30 mm; siphon/saddle ratio 3.7. In general, conforming to other members of the *Mochthogenes* Group, distinctive in the following features. *Head*. Seta 4-C double, close together near dorsal midline, its length slightly longer than distance between bases of the pair; 5-C very weak, short, subequal to 4-C, 5,6 branched; 6-C strong, double, apex reaching beyond anterior margin of labrum. *Thorax*. Spiculation absent; seta 3-P single, about 0.5 of the length of 1,2-P; 4-P triple, of the same magnitude as 3-P; 1-M 4 branched, subequal to 3,4-M. *Abdomen*. Unspiculated; setae 6-I,II and 7-I strong and dark, the rest pale and rather inconspicuous; 6-III 4 branched; 6-IV-VI usually triple (3-4); 1-III-VI 3,4 branched. Comb scales 45-50, all of which are subequal in size; apical fringe rounded or normal; seta 1-VIII 4 branched; 2-VIII single or double; 3-VIII 8 branched; 5-VIII double. Saddle yellowish; seta 2-X double; 4-X with 7 pairs of setae, most proximal pair strongly reduced, more or less detached from grid. *Siphon*. Slender, moderately long, uniformly yellowish except for basal dark ring; pecten teeth 8,9, all very strong, dark and simple; siphonal tufts 5 pairs, 4,5 branched each, all placed almost in a line on ventral surface; most proximal pair 1.5-2.0 times as long as siphonal width at point of attachment, rest gradually shorter; 2-S minute; median caudal filament well developed.

DISTRIBUTION. In addition to the previous records from India and Peninsular Malaysia (Sirivanakarn 1972; Sirivanakarn and Ramalingam 1976), this species is now also reported from Sri Lanka. This new record is based on 4 males, 5 females, 2 pupal skins, 1 pupal and larval skins and 1 whole larva from Southern and Sabaragamuwa provinces, Sri Lanka, 8-23 July 1975, E. L. Peyton and Y.-M. Huang, collectors.

TAXONOMIC DISCUSSION. The description of the pupa and larva of *pluvialis* is based on the reared specimens collected from Sri Lanka. The males associated with the above pupae and larvae essentially agree with the type from India in every detail of the genitalia but the general adult features differ slightly from those in India in having all erect scales of the head entirely pale yellowish, the presence of a broad dark pigmented area on the pleuron and in having some pale scales on the anterior promontory and marginal areas of the mesonotum. It is quite probable that a complex of different geographic forms is involved, but this cannot be resolved until reared material from the type locality becomes available.

BIONOMICS. In Sri Lanka, *pluvialis* immatures have been found in small ground pools, including a rock hole. The immatures were collected on 4 occasions: from a small ground pool hidden under a log, an elephant footprint, a rock hole and a pit covered by a fallen tree trunk. These breeding sites were under partial or heavy shade of secondary rain forest in hilly areas at an elevation ranging from 245-610 m. Nothing is known about the adult biology.

Culex (Eumelanomyia) iphis Barraud
(Fig. 4)

Culex iphis Barraud 1924:1279(♂*,♀). Lectotype ♂, Nilgiri Hills, Madras, INDIA (BMNH; selection of Sirivanakarn 1972:56-7).

Culex (Mochthogenes) iphis Barraud, Edwards 1932:195(taxonomy); Barraud 1934:354(♂*,♀).

Culex (Eumelanomyia) iphis Barraud, Sirivanakarn 1971:68 (taxonomy); Sirivanakarn 1972:56(♂*,♀*).

PUPA (Fig. 4). Abdomen 2.34 mm. Paddle 0.72 mm. Trumpet 0.55 mm, index 7. Cephalothorax and abdomen yellowish with brownish tinge not forming definite darkened area. *Trumpet*. Dark brown, basal 0.5 narrow and uniformly cylindrical, apical 0.5 slightly swollen proximally, narrowed distally; meacus without slit. Complete chaetotaxy as figured, the following are diagnostic. *Cephalothorax*. Seta 1-C single or double; 3-C strong, single; 4-C subequal to 1-C, single; 5-C double; 7-C single; 8,9-C strong, dark, 8-C double or triple; 9-C single. *Metanotum*. Seta 10-C usually double (2-3); 11-C single; 12-C double. *Abdomen*. Setae 3-I-III single; 5-IV-VI dark, strong, double, their length about 1.5 times as long as segment following; 6-III-VI usually double (2-3); 2-VII mesad of 1-VII; 9-VII usually double, sometimes triple; 4-VIII single; 9-VIII usually 3,4 branched (2-4). *Paddle*. Broad; apical margin produced into a blunt point; midrib pale; setae 1,2-P present.

LARVA (Fig. 4). Head 0.78 mm. Siphon 1.5 mm; index 8. Saddle 0.36 mm; siphon/saddle ratio 4. Generally conforming to the *Mochthogenes* Group (Sirivanakarn 1972), distinctive in the following combination of characters. *Head*. Integument yellowish with considerable amount of brownish tinge; seta 4-C widely spaced, single or forked into 2 branches, its length about 0.5 of distance between bases of the pair; 5-C single or distally forked into 2 branches, its length slightly less than 0.5 of 6-C; latter strong, double, its apex reaching beyond anterior margin of labrum. Antennal shaft entirely dark. *Thorax*. Seta 4-P strong, single, its length about 0.5 of 1, 2-P; 1-M as long as 3-M, double.

Abdomen. Setae 6-III-VI strong, all triple; 1-III-VI usually 4 branched (3-4). Comb scales 60, all with normal fringe of evenly fine spicules; seta 2-VIII single. Saddle seta 2-X double; 4-X with 7 pairs of setae, all within grid.

Siphon. Slender, moderately long, same color as head capsule; pecten teeth 12-14, distal ones narrow, elongate, with 3-5 strong basal denticles and several minute distal denticles; siphonal tufts usually 6 pairs (6-6.5), all rather strong, very distinct, usually 4 branched each (3-4); most proximal tuft longest, about 1.5 times as long as siphonal width at point of attachment, rest gradually shorter; median caudal filament absent.

DISTRIBUTION. Known only from the type-locality in Nilgiri Hills, Madras, India. *Material examined:* 3 males, all with associated pupal and larval skins, well and coconut stump, April-October 1974, B. N. Mohan, collector.

TAXONOMIC DISCUSSION. The pupa of *iphis* can be readily distinguished from other members of the *Mochthogenes* Group by (1) the shape of the trumpet; (2) seta 11-C single; (3) setae 3-I-III single and (4) apex of the paddle produced into a blunt point. The larva resembles *mohani* described above in most features of the chaetotaxy. It can, however, be separated from the latter by (1) the entirely dark antennal shaft and (2) the siphon with at least 6 pairs of sub-ventral tufts.

BIONOMICS. The immatures of *iphis* have been collected twice, once in an irrigation well and once in a coconut tree stump. In the second instance (coll. no. 151), the larvae were found in association with immatures of *mohani*. No information is available on adult biology.

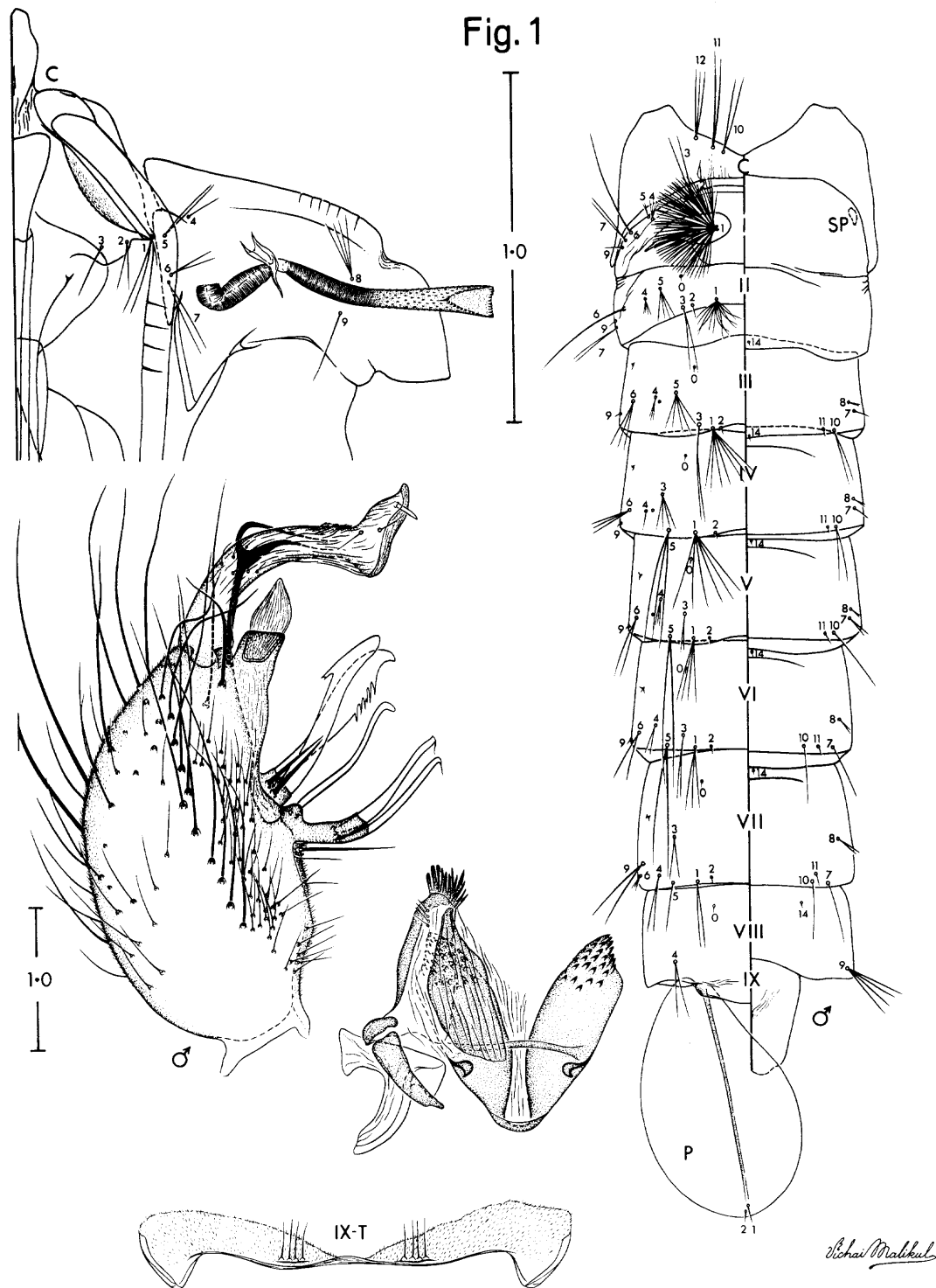
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LITERATURE CITED

- Barraud, P. J. 1924. A revision of the culicine mosquitoes of India. Part XIII. Further descriptions of Indian species of *Culex* L. including three new species. Indian J. Med. Res. 11:1275-82, 2 pl.
- . 1934. The fauna of British India including Ceylon and Burma. Diptera. Vol. V. Family Culicidae. Tribes Megarhinini and Culicini. Taylor and Francis, London, 463 p., 7 pl.
- Edwards, F. W. 1932. Diptera, Fam. Culicidae. In P. Wytsman, Genera Insectorum, Desmet-Verteneuil, Brussels. Fasc. 194, 285 p., 5 pl.

- Sirivanakarn, S. 1971. Contributions to the mosquito fauna of Southeast Asia. XI. A proposed reclassification of *Neoculex* Dyar based principally on the male terminalia. Contrib. Am. Entomol. Inst. (Ann Arbor) 7(3):62-85.
-
- _____. 1972. Contributions to the mosquito fauna of Southeast Asia. XIII. The genus *Culex*, subgenus *Eumelanomyia* Theobald in Southeast Asia and adjacent areas. Contrib. Am. Entomol. Inst. (Ann Arbor) 8(6):1-86.
- Sirivanakarn, S. and S. Ramalingam. 1976. A new species of *Culex* (*Eumelanomyia*) Theobald with notes on three other species from Malaysia (Diptera: Culicidae). Mosq. Syst. 8:209-16.



Culex (Eumelanomyia) mohani

